v. Insertion Power Supply Systems

The insertion region contains both beam bending magnet and focusing elements. To reduce power supply cost and minimize cold penetrations these elements are connected in series with the main dipole or quadrupole circuits. However, provisions are made to adjust each insertion quadrupole separately as required, either through a shunt, or an auxiliary trim quadrupole.

Insertion Dipole Power Supplies

The regular arc dipoles and insertion dipoles D5, D6, D8 and D9 are in series with the supply side of the main dipole bus. The remaining insertion dipoles, D0, and in the blue ring, DX, are in the circuit return leg. Figures 2-6 through 2-8 shows the detailed circuit arrangement of the dipoles in the insertion regions. The quench protection assemblies and main power supplies are shown there as well. In these figures, three power supplies are shown, PS1, PS2, and PS3. They are connected to the insertion dipoles with a link box, to allow for the best configuration of voltages and polarities for a given species combination. Table 2-4 shows the arrangement of power supplies for typical cases.

Provision for shunting current around D5 and D6 will be provided, but the lengths of these magnets will be adjusted so that no electrical correction is expected.

Table 2-4. Insertion Dipole Configuration

Power Supply	Particle	Current Rating	Polarity
PS1 - Yellow	Au	2000 A	As Shown
PS2 - Blue	Au	2000 A	As Shown
PS3 - Blue		600 A	As Shown
PS1 - Yellow	Cu	2000 A	As Shown
PS2 - Blue	Cu	2000 A	As Shown
PS3 - Blue		600 A	As Shown
PS1 - Yellow	p	2000 A	As Shown
PS2 - Blue	p	2000 A	As Shown
PS3 - Blue		600 A	As Shown
PS1 - Yellow	Si	2000 A	As Shown
PS2 - Blue	Si	2000 A	As Shown
PS3 - Blue		600 A	As Shown
PS1 - Yellow	Au	2000 A	As Shown
PS2 - Blue	d	2000 A	As Shown
PS3 - Blue		600 A	Reversed

The insertion dipole configuration for p-Au is not shown in Table 2-4. This will be determined at the time of the p-Au run.

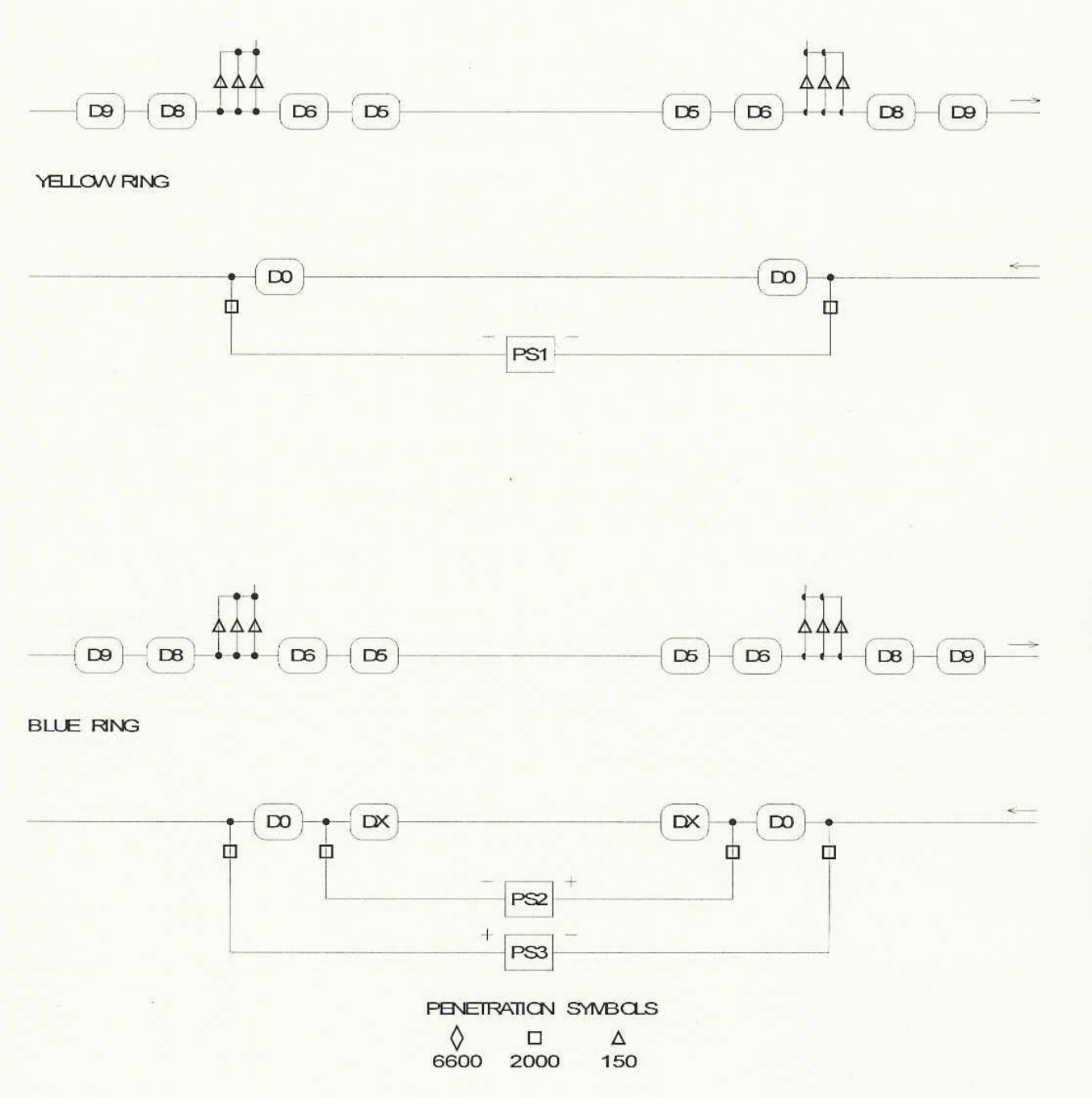

Fig. 2-6. Insertion dipoles at 2, 6, 8 and 12 o'clock.

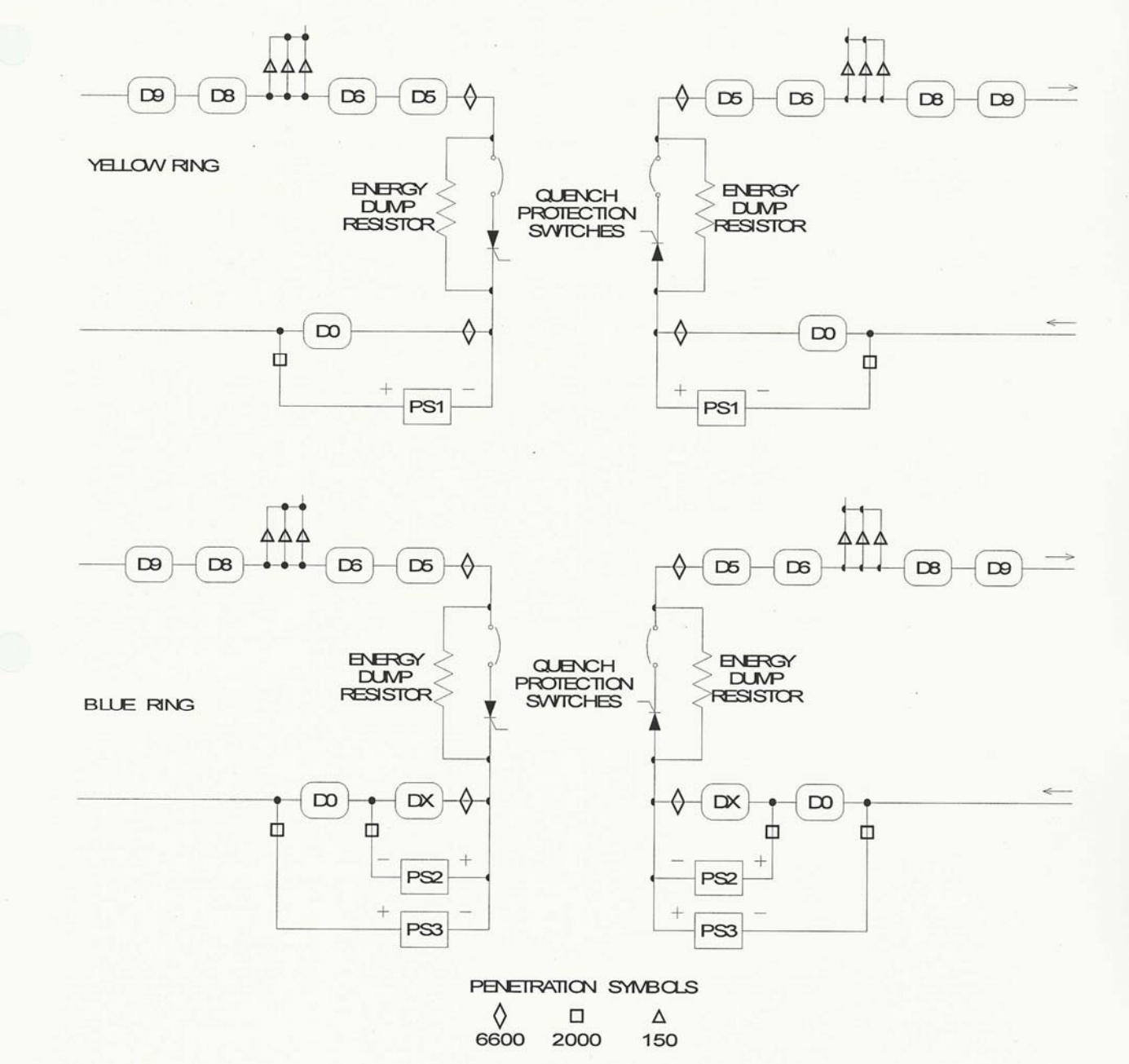

Fig. 2-7. Insertion dipoles at 10 o'clock.

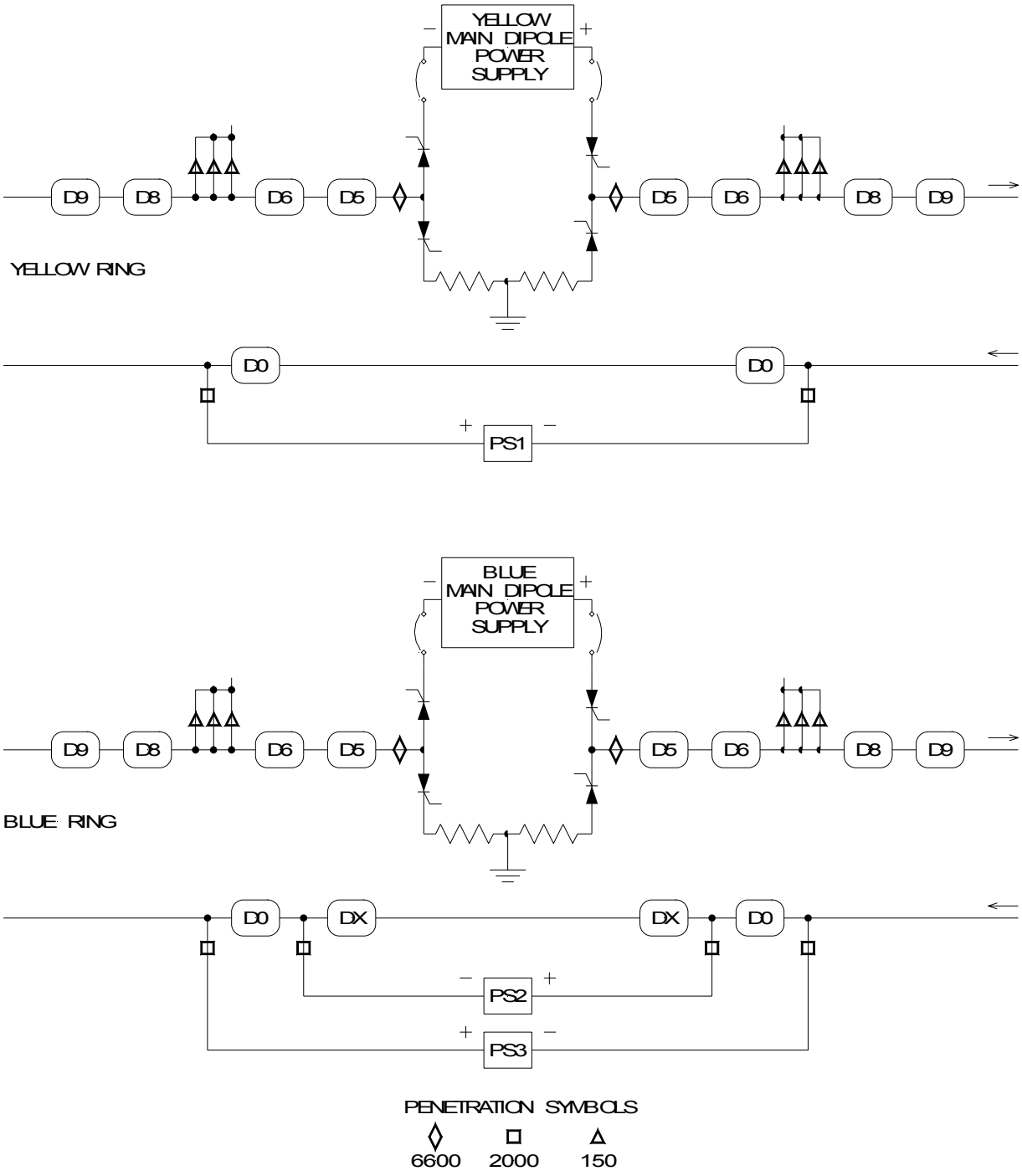

Fig. 2-8. Insertion dipoles at 4 o'clock.

Insertion Quadrupole Power Supplies

The quadrupole insertion schematics are shown in Figs. 2-9 through 2-11. Current flows through the regular Q_V quadrupoles, then through a set of insertion quadrupoles. This pattern repeats until the circuit has gone half way around the ring, then returns through the series connection of the Q_H regular quadrupoles (see Fig. 2-3) and the remaining insertion quadrupoles.

The choice of circuit configuration for the various insertion quadrupoles has been chosen to minimize power supply and current penetration requirements and is sized to allow a continuous change of $ß^*$ between 1 and 10 m. This is implemented in two ways. The current in some of the insertion quadrupoles is varied with shunt supplies. But, in CTQ4, 5 and 6, trim quadrupoles are added where the sextupoles are located in the CQS assemblies. These trim magnets allow tuning the insertions at lower currents. The approximate inductance of each of these trim magnets is 700mH. The shunt supply at CTQ6 is fixed during the $ß^*$ change.

The inner and outer quadrupole currents at Q6, 7 and 9 are close enough that they can share a single power supply that bridges the crossing point. This is not possible at 10:00 or at 4:00 for Q6 and Q7.

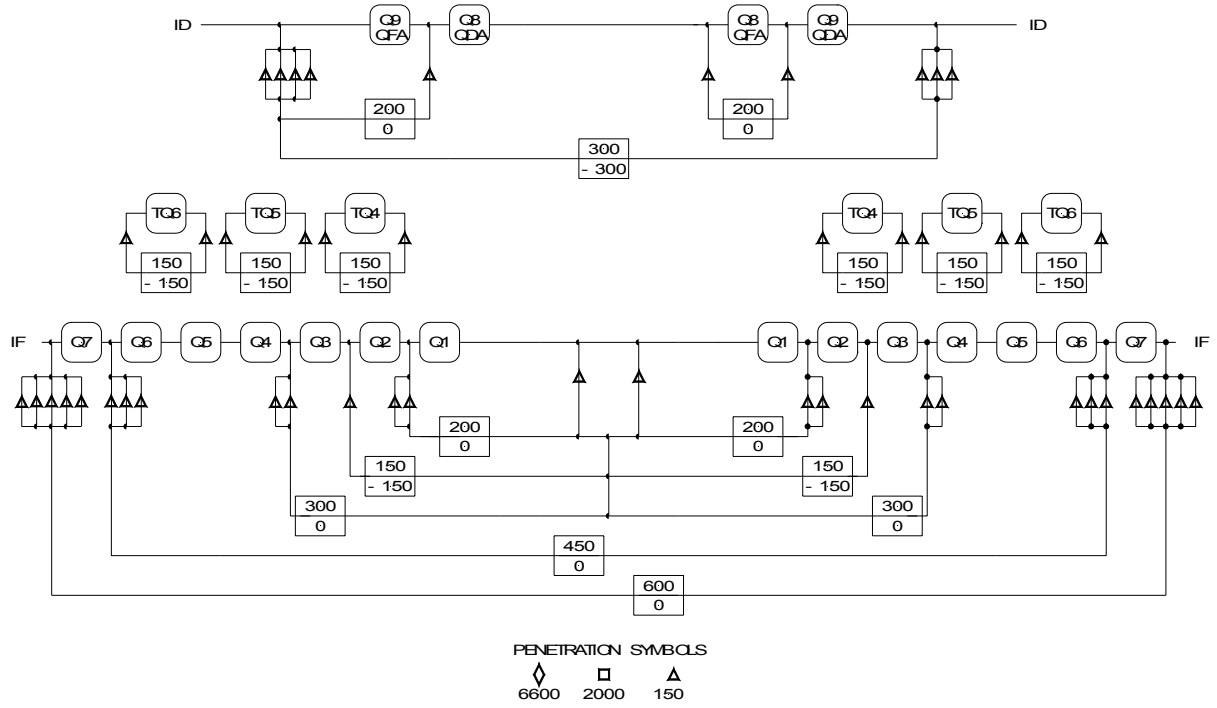

Fig. 2-9. Insertion quads at 2, 6, 8 and 12 o'clock.

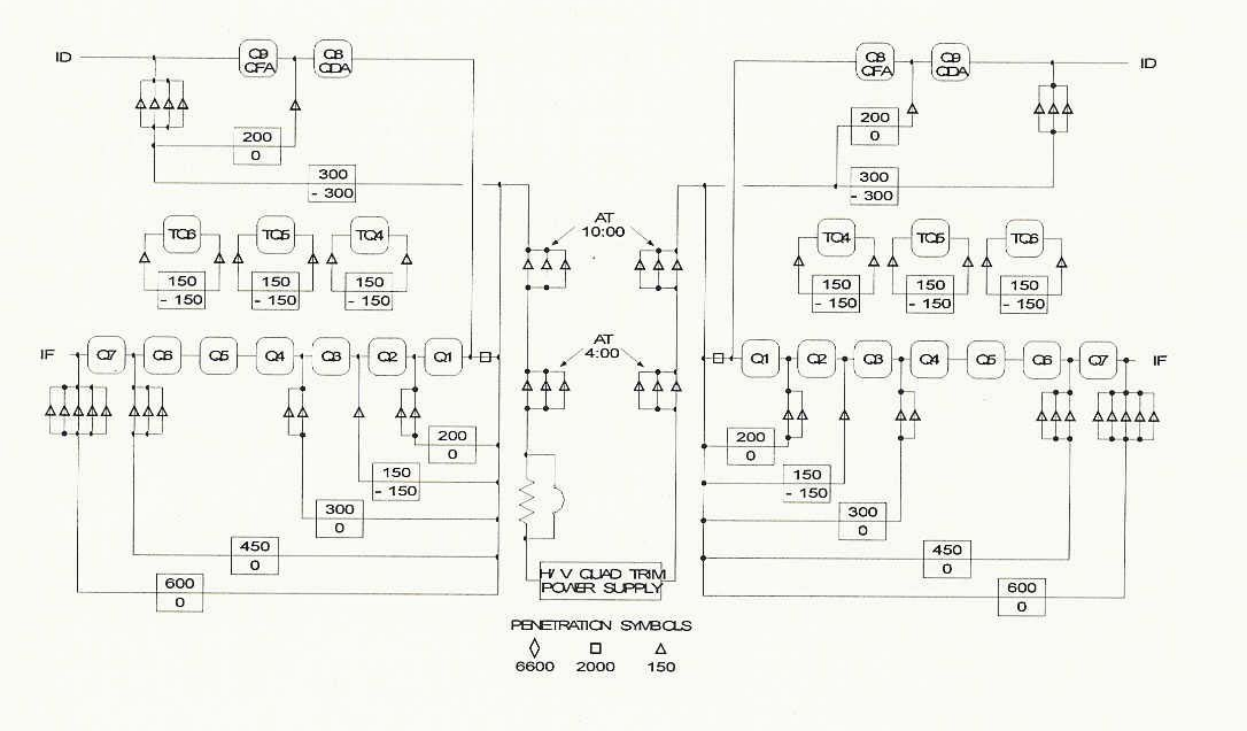

Fig. 2-10. Insertion quads at 10 o'clock.

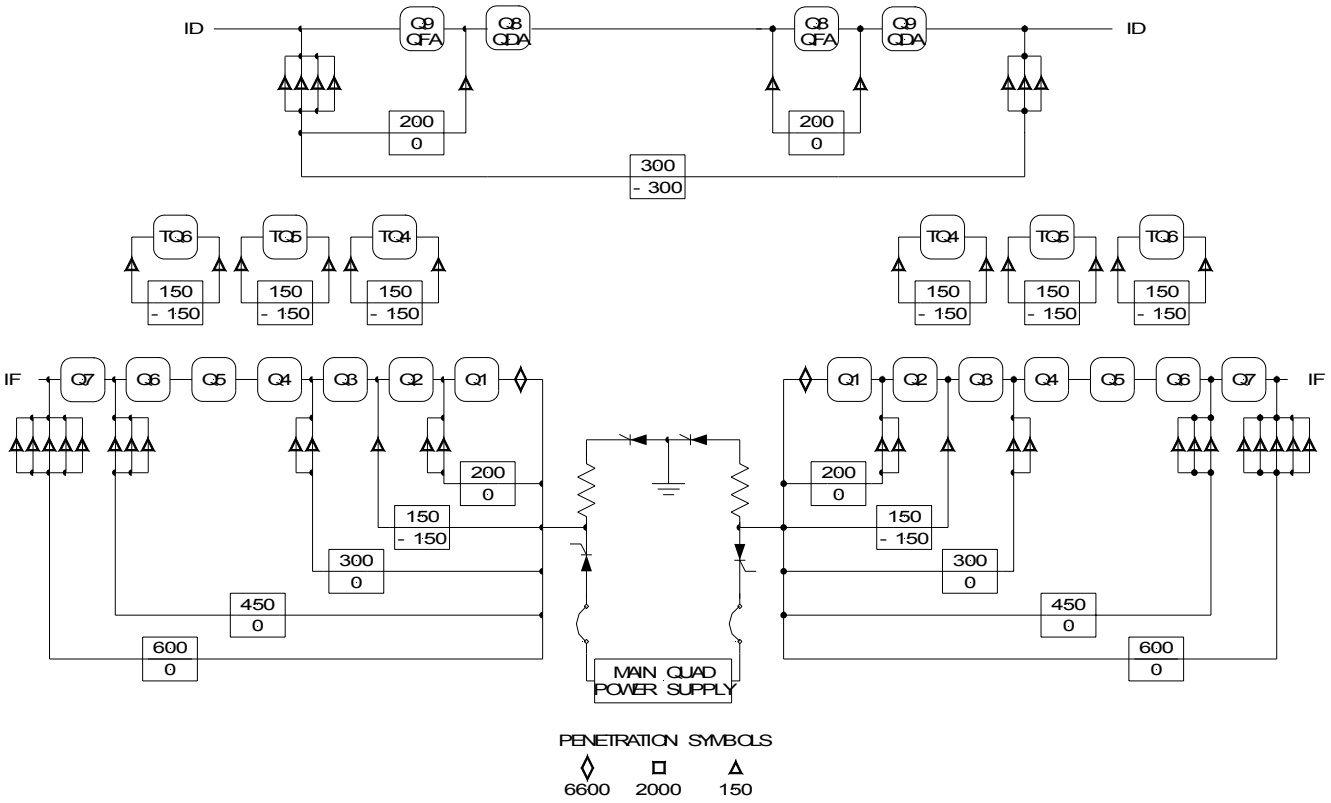

Fig. 2-11. Insertion quads at 4 o'clock.